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## Environmental factors during adolescence associated with later development of psychotic disorders – A nested case-control study

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## ABSTRACT

Etiologies of psychotic disorders (schizophrenia and bipolar disorder) are conceptualized as interplay between genetic and environmental factors. The adolescent period is characterized by changes in social roles and expectations that may interact with biological changes or psychosocial stressors. Few studies focus on the adolescents' own reports of perceived risk factors. To assess differences at age 16 between persons who later develop psychotic disorders ("Confirmed Psychosis", CP) and their class-mates ("Population Controls", PC) we collected information on: (1) Social support factors (size of social network and expectancies of social support from friends), (2) Cognitive functioning (concentrating in the classroom, actual grades and expectancies of own academic achievements) and (3) Problems and stressors in families (illness or loss of work for parents), and in relationship with others (exposure to bullying, violence or sexual violation). Self-reported data from students at 15–16 years of age were linked to the case-registers from the "Thematically Organized Psychosis (TOP) Study". The CP group reported more economic problems in their families, smaller social network and lower academic expectation than the PC group. The results support the notion that long-term socioeconomic stressors in adolescence may serve as risk factors for the development of psychotic disorders.

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## 1. Introduction

The complex etiologies of psychotic disorders (schizophrenia and bipolar disorder) are conceptualized as interplay between genetic and environmental factors. In addition to the strong genetic component environmental risk factors also play an important role (Van Os and Kapur, 2009; Ripke et al., 2011). In schizophrenia, this is supported by studies showing geographical variations in incidence (McGrath et al., 2004) and increased risks associated with pregnancy/delivery complications, urbanicity, migration, cannabis use and early traumatic experiences (Cantor-Graae, 2007; Schlossberg et al., 2010; Brown, 2011).

Schizophrenia is seen as a neurodevelopmental disorder; i.e. a consequence of developmental abnormalities starting very early in life, but without evident clinical symptoms until late adolescence or early adulthood (Murray and Lewis, 1987; Weinberger, 1987; Rapoport et al., 2005). In addition to clinical symptoms, many patients experience cognitive and social dysfunction (Bratlien et al., 2013). Support for the neurodevelopmental hypothesis comes partly from birth-cohort studies showing that children who later develop schizophrenia have subtle, but discernible differences in developmental trajectories compared to children who do not develop the disorder including indications of pre-morbid cognitive disturbances (Welham et al., 2009). While the main amount of data concerning the developmental origins of psychotic disorders concerns early development, there is now an increasing focus also on the adolescent phase. Both birth cohort and cross-sectional studies, the latter mainly of military conscripts, have given valuable information about this period. This particularly concerns the early presence of cognitive and social dysfunction in persons who later develop schizophrenia (Zammit et al., 2002;

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Reichenberg et al., 2005; David et al., 2008). Also socioeconomic aspects during this phase of life are found to be predictive of later psychosis (Wicks et al., 2005), in addition to the experience of bullying and peer victimization (Schreier et al., 2009; Arseneault et al., 2010; Schlossberg et al., 2010; Mackie et al., 2011).

An increasing amount of data indicates that there are shared genetic and environmental risk factors between schizophrenia and bipolar disorder (Van Os and Kapur, 2009; Sklar et al., 2011). The neurodevelopmental aspect of bipolar disorder is generally seen as minor.

However, recent studies also show an increased prevalence of minor physical anomalies (Akabaliev et al., 2011), and that cognitive and social dysfunctions are present already at first treatment in patients with bipolar disorder (Torres et al., 2010; Hellvin et al., 2012, 2013).

The onset of clinical symptoms in relation to adolescence and early adulthood in both disorders have been linked to the maturational processes in the CNS taking place in this period (Cannon et al., 2008), as indicated by considerable alterations of brain structure and function (Woo and Crowell, 2005; Gonzalez-Burgos et al., 2010). Adolescence is also a period characterized by extensive changes in social roles and expectations that may both induce and interact with other biological or psychosocial stressors. In light of the increasing knowledge about how disturbances in the stress response may interact with genetic vulnerability in the early development of clinical symptoms, the aspect of perceived stressors is of importance. Several studies indicate that stress exposure play a role in the development of psychotic disorder; both in the form of early trauma and in the form of stressful experiences closer to disorder onset (Shevlin et al., 2008; Varese et al., 2012). Dysregulation of stress response systems may serve as a risk factor both for the onset of psychosis per se, and for a more severe symptomatology (Aas et al., 2012; Aiello et al., 2012). Recent research indicates that the perception of stressors might also be different in persons at the risk of developing a psychotic disorder (Tessner et al., 2011; Phillips et al., 2012). There is however a lack of studies on the role of perceived stressors as a risk factor for psychotic disorders.

In light of this it is of importance that cohort studies so far primarily have used information from teachers, parents and health workers, and more rarely information from the youths themselves. In the current study we take advantage of the unique self-reported data in Norwegian Youth Studies (YS) initiated by the Norwegian Institute of Public Health (NIPH) and included all 10th grade students (15–16 years of age) in three counties (Søgaard and Eide, 2007). For the purpose of the study this information was linked to the case-registers from the ongoing “Thematically Organized Psychosis (TOP) Study” recruiting patients from the catchment area-based treatment systems in the same counties.

In the current study we thus seek to establish knowledge about the association between social and environmental factors in adolescence and later development of psychosis in a representative community sample. Our choice of relevant factors are based on the existing literature in combination with the information available from the YS survey. We more specifically aim at answering the following questions: to what extent do persons who later develop psychotic disorders report differences in their perceived social functioning at age 16 (size of social network and expectancies of social support from friends), perceived problems in cognitive functions (concentrating in the classroom, actual grades and expectancies of own academic achievements) and perceived problems and social stressors in interaction with their families (illness or loss of work for parents, parents having economic problems) and in interactions with others (being exposed to bullying, violence or sexual violation) at age 16; compared to their class-mates?

## 2. Methods

### 2.1. Youth Studies

The youth part of the Oslo Health Study (YOUNG HUBRO) encompassed all individuals in 10th grade (15–16 years old) included in the available class lists for all schools in Oslo in the years 2000 and 2001. The study was extended to the counties of Hedmark and Oppland (YOUNG OppHed), encompassing all individuals in 10th grade in Hedmark in 2001 and Oppland in 2002. In all three counties, students filled in two questionnaires during two school hours. A project assistant was present in the classroom to instruct the students and carry out the practical part of the survey. Questionnaires were left at the school for completion by those students who were absent from school on the day of the survey. The school was later contacted if the questionnaires were not returned. New questionnaires were sent to the student's home asking the student to fill in and return them in an enclosed stamped addressed envelope if they were not completed in the school. A total of 7343 students answered at least one question on one of the survey's questionnaires in Oslo (88% of the 8316 eligible for participation), 1939 in Hedmark (88% of the eligible 2203) and 1877 in Oppland (90% of the 2085 eligible). Of this total of 11,159 participants, 58 had to be removed from further analyses because of insufficient data quality (41) or, in case of identified patients, did not consent to the merging of files from the TOP database containing patient data (17) with those from the Youth Health Study, thus leaving 11,101 in the available data file. The YS study protocols were placed before the Regional Committee for Medical and Health Research Ethics South Eastern Norway and approved by the Norwegian Data Inspectorate. The study has been conducted in accordance with the World Medical Association Declaration of Helsinki (Fig. 1).

### 2.2. Clinical samples

The main inclusion criteria for both clinical samples in the current study were meeting the DSM-IV criteria for a narrow schizophrenia spectrum diagnosis (schizophrenia, schizophreniform or schizoaffective disorder), bipolar spectrum diagnosis (I, II or NOS with psychotic episodes) or other psychotic disorders (delusional disorder, psychosis NOS or unipolar depression with psychotic symptoms) during their lifetime.

Exclusion criterias for both clinical samples were a history of serious head injury with neurological complications, a neurological disorder, mental retardation and being unable to comprehend the Norwegian language at a level necessary to complete the interviews.

During 2008 and 2009 all in- and out-patients with a diagnosis of a psychotic disorder at Innlandet Hospital Trust (the only psychiatric treatment facilities in the counties Hedmark and Oppland with a combined total of 399,000 inhabitants) born in 1985 and 1986 (i.e. 16 years old in 2001/2002 and thus potential participants in the YOUNG OppHed survey) were contacted and interviewed as part of the multi-center “Thematically Organized Psychosis (TOP)” research study. We here initially identified 29 potential participants.

In addition, the Thematically Organized Psychosis (TOP) research study's group in Oslo had been recruiting consecutive patients with severe mental disorders from all major hospitals in Oslo using the same protocol since 2003. These hospitals covered catchment areas of 485,000 inhabitants (88% of the total population of Oslo), and both inner city and suburban areas, thus to a large extent representing the socio-demographic characteristics of Oslo. By early 2010 the Oslo part of the study included 44 patients born in 1984/85 and thus potential participants in the YoungHUBRO.

The study protocols for both clinical studies were approved by the Regional Committee for Medical and Health Research Ethics, South-Eastern Norway and by the Norwegian Data Inspectorate. The informed consent form for participants in Hedmark and Oppland included the direct consent to link with the YS, while the older consent form used in Oslo did not include specific consent to link to these surveys necessitating re-contact with the participants.

### 2.3. Subjects and study sample

For the purpose of the current study, and with permission from the Regional Committee for Medical and Health Research Ethics, South-Eastern Norway, the data from the YS and from the two clinical samples were linked anonymously by the NIPH. A total of 19 clinical cases living in – and interviewed by the Hedmark and Oppland assessment team and 32 living in – and interviewed by the Oslo assessment team were in this way identified in the YS database. Since the original informed consent for the Oslo part of the study did not include particular permission to use YS data, the Oslo participants were contacted by mail and asked for their informed consent. A total of 15 gave informed consent while 17 of the Oslo participants did not return consent forms and were thus removed from the combined database. In addition, two patients identified in the YoungHUBRO, and two in the YoungOppHed had significant deficiencies (missing data) in their YS information and could not be included in the analyses. This left 30 persons forming the Confirmed Psychosis Group (CP); where 16 had participated in the YoungOppHed and 14 had participated in the YoungHUBRO/17 clinically assessed by the

Hedmark and Oppland assessment team and 13 assessed by the Oslo team. Of these 30, 11 had a narrow schizophrenia spectrum diagnosis (schizophrenia, schizophreniform or schizoaffective disorder), 11 had a bipolar spectrum diagnosis (I, II or NOS with psychotic episodes) and eight had other psychotic disorders (delusional disorder, psychosis NOS or unipolar depression with psychotic symptoms).

Based on existing information in the clinical datasets, a total of nine persons (three in each of these broad diagnostic groups) reported that they had symptoms indicating that they may have experienced their first psychotic episode before the age of 17, i.e. potentially before completing the YS (forming the CP subgroup “pre-questionnaire conversion” – PreQC), while 21 reported an age of onset over the age of 17 (the “post-questionnaire conversion subgroup” – PostQC). The remaining YS participants (11,101 – 4 – 30 = 11067) who had not been identified through the clinical studies were considered as Population Controls (PC) for the purpose of this study. Out of these, only 2850 of the PC with full datasets were used in the analyses.

## 2.4. Assessments

### 2.4.1. Relevant assessment of social relations in the YS questionnaire

**2.4.1.1. Attachment to friends.** The participants were asked to rate the following statements on a 1–4 Likert type scale, dichotomized into agree/disagree: (a) I feel closely attached to my friends; (b) My friends value my opinions; (c) I can help/support my friends; and (d) I can count on my friends when I need help.

**2.4.1.2. Size of social network.** The participants were asked to answer the following two questions – “How many persons outside the family would help if you had personal problems” respectively “practical problems”.

### 2.4.2. Relevant assessments of academic functioning from the YS questionnaire

**2.4.2.1. School grades.** The participants were asked to give their last grades (1 worst to 6 best) in Mathematics, Written Norwegian, English and Social Studies. Due to a considerable association between grades we used the mean of the four different grades in the analyses.

**2.4.2.2. Concentration difficulties.** The participants were asked if they had experienced any difficulties concentrating in class. (The scores “1=No; 2=Yes, at times; 3=Yes, often” were recoded into either 0=1+2 “No” or 1=3 “Yes, often” for the purpose of the multivariate analyses.)

**2.4.2.3. Academic ambitions.** The participants were asked about the “highest education level they had considered”. Their answers were dichotomized into ambitions

of attending university or regional colleges vs. all other educational plans for the purpose of the analyses.

### 2.4.3. Relevant measures environmental stressors from the YS questionnaire

**2.4.3.1. Family attachment.** The participants were asked to rate the following statements on a 1–4 Likert type scale: (a) I feel attached to my family; (b) My family takes me seriously; (c) My family values my opinions; (d) I mean a lot to my family; and (e) I can count on my family when I need help.

**2.4.3.2. Other family conditions.** The participants were asked if their father had paid employment at the time of the survey. For the purpose of the regression analyses we dichotomized into working full time or not. They were also asked about whom they lived with at present. For the purpose of the analyses this was dichotomized into living with both parents or not.

**2.4.3.3. Negative life events in last 12 months.** The participants were asked if their parents were unemployed or qualified for a disability pension, or if someone close to them had been seriously ill, injured or had died.

**2.4.3.4. Traumatic events in last 12 months.** The participants were asked if they had been exposed to sexual violations (including indecent exposure); answered yes/no and experienced bullying at or on their way to school; Likert type scale 1–4: Never, sometimes, once a week, and several times a week. Additionally they were asked about being victimized of other forms of violence on a 1–4 Likert scale: No, only by youths, only by adults or both youths and adults. The scores were dichotomized into 0=“never” or 1=“yes”.

**2.4.3.5. Other ongoing worries and problems in last 12 months.** The participants were asked if they had experienced quarrels or conflicts with their parents, a parent/carer with mental problems, a parent/carer with economic problems, a parent/carer with alcohol or drug problems, problems in relation to friends or worries about sex. Scores were on a 1–4 Likert scale 1=“no”, 4=“a lot”, or dichotomized into “no” (1–3) or “often” (4) when more appropriate.

### 2.4.4. Clinical assessments

The clinical assessments of the CP group were at both sites performed by trained psychologists or psychiatrists. All had participated in the TOP study group’s common training program for diagnostic and symptom assessment, including both the Hedmark/Oppland and Oslo assessment teams. Diagnoses were based on the Structured Clinical Interview for DSM-IV Axis I disorders (SCID-I) (First and Spitzer, 1997). For DSM-IV diagnostics, mean overall  $\kappa$  with training videos was 0.77, and mean overall  $\kappa$  for a randomly drawn subset of actual study patients was also 0.77 (95% CI 0.60 – 0.94).

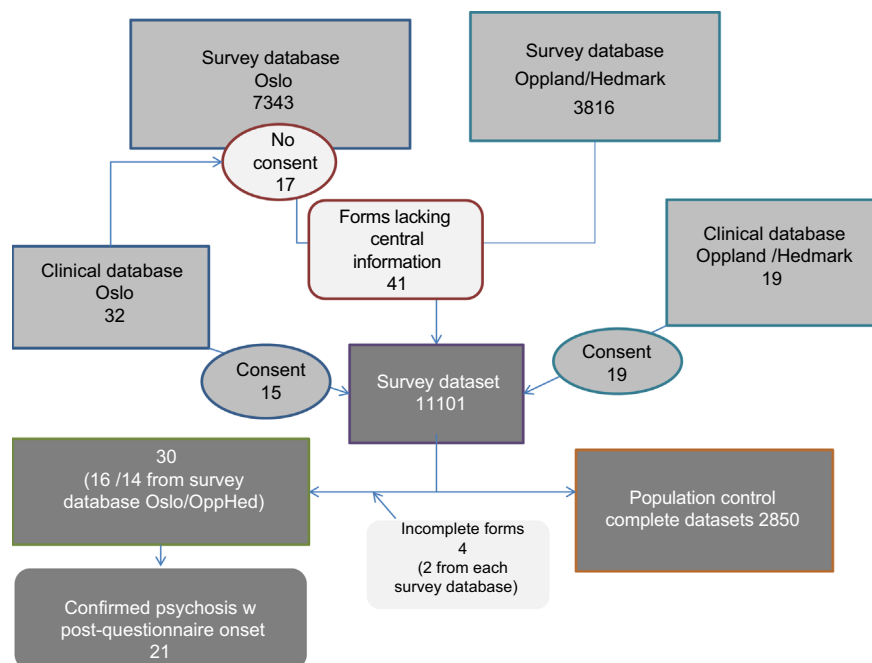


Fig. 1. Study flow chart.

### 2.5. Statistics

We used the Statistical Package for the Social Sciences (SPSS Inc., Chicago, version 17.0). The variables were explored for normality. Group differences between clinical cases and the PC group were examined with  $\chi^2$  tests or Fisher's exact test where relevant, *t*-tests or the Mann–Whitney *U* test as deemed appropriate, with ANOVAs or Kruskal–Wallis tests in the follow-up analyses. The bivariate analyses were followed up with binary logistic regression analyses with group membership (i.e. CP or PC) as the dependent variable. The statistical level of significance for the final analyses were based on this set at the  $p < 0.05$  (with *p*-levels in the 0.05–0.09 range defined as trend-levels).

For the multivariate regression analyses we used a hierarchical (forced-entry) procedure introducing the independent variables in blocks. The variables examined in the bivariate analyses were based on hypotheses regarding their association to psychotic disorders from previous studies as indicated in the introduction. The variables with an association to caseness with a *p*-value  $< 0.1$  in the bivariate analyses were examined further in the multivariate analyses. Two of these variables ("father working full time" and "very often economic problems for parent/carer last year") had a high degree of association and could not be entered in the model at the same time without invalidating the analyses. Of the two possible and competing models we chose the model containing "very often economic problems for parent/carer last year" because of a better model fit than the model containing "father working full time". The final model thus consisted of "N of persons that would help if practical problems" as the first step, "Victimized or experiencing other forms of violence last year" as the second step, "Ambitions attending university or college level" as the third and "Very often economic problems for parent/carer last year" at the fourth and final step. Skewed variables were either dichotomized or log 10 transformed to achieve normality (i.e. the variable "number of persons outside family that would help with personal or practical problems") before entering them into the multivariate analyses.

Eight patients had missing data for one to a maximum of four of the variables in question. They were in the analyses substituted with the mean or median value of the PC group.

### 3. Results

The median age at the diagnostic interview for the CP group was 22 years (range 19–26). The self-reported median age at the onset of the first psychotic episode was 19 years (range 7–23) and the median duration of psychotic illness at interview was 3 years (range 0–15).

The CP group reported statistically significant smaller social networks than PC in regard to their expectancies of help for practical problems. There were no differences in the number of persons they expected would help them if they had personal problems, and they reported no differences for all four measures of attachment to friends. Restricting the analyses to only those who had not yet experienced their first psychotic symptoms did not influence the findings.

There were also no significant differences in proxies for cognitive functioning such as school grades or difficulties concentrating in class. The CP group reported lower academic ambitions than the PC, at a trend level for significance. Restricting the analyses to only those who had not yet experienced their first psychotic symptoms, we still found that the remaining PostQC group reported more difficulties with concentration in class at a trend level for statistical significance ( $p = 0.08$ ).

The CP group additionally reported significantly more economic problems in their families than the PC group, and the number of fathers who were not working full-time was significantly lower. We however found no differences in the rates of unemployed parents, parents getting disability pension during the last 12 months or in the number of single parent households.

There were also no differences in their reports of experiences of severe negative life events or other social stressors over the last year. The only exception was for the rate of being exposed to violence during the last 12 months, where the CP group reported lower rates than PC, at a trend level for statistical significance.

"Having parents with economic problems" and not having "academic ambitions at university or college level" had a statically

significant influence on the likelihood of being in the CP group. That the person had not experienced any violent behavior and had less expectations of social support from friends, had an influence at a level often considered as at trend-level for statistical significance (i.e. a *p* level between 0.05 and 0.09) (Table 2). Restricting the analysis to only those who had not yet experienced their first psychotic symptoms, the influence of parents' economic problems no longer reach the level of statistical significance, but without changes in OR for this variable or with changes regarding the influence of the other variables.

### 4. Discussion

The main finding of the current study is significantly more economic problems during adolescence in the household of individuals who later developed psychosis compared to healthy controls. There were also indications that this group had lower academic expectations, smaller social networks, and rather unexpectedly were less exposed to violence.

The finding of an association between the risk of psychotic disorders and economic and employment problems for the parents is in line with earlier research indicating that social adversity, presumably leading to increased psychosocial stress, may be a risk factor for schizophrenia. A Swedish national cohort study found that living in rented apartments, having low socioeconomic status, unemployment, coming from a single-parent household, or households receiving social welfare benefits increased the risk of psychosis in later life (Wicks et al., 2005). A follow-up study showed that this also was the case for adoptees; ruling out that severe mental disorder in parents was the common link between low socioeconomic status and risk of psychotic disorders (Wicks et al., 2010), in line with our finding that there were no differences between the groups for "Parent/carer had mental problems last year".

We did not find differences between 16-years olds who later developed a psychotic disorder and their healthy class-mates regarding quality of social networks, proxies of cognitive functioning or social stressors at the age of 16. Further, we did not find any clear indications of more current exposure to traumatic situations previous year and contrary to expectations we found that the clinical group was less exposed to violence at age 16 (Varese et al., 2012). These findings might at first glance seem at odds with previous findings regarding risk factors for schizophrenia and other psychotic disorders, showing lower quality of social networks and increased traumatic events for the later patient group (Welham et al., 2009; Niendam et al., 2009; Heins et al., 2011). However, while there is relatively strong evidence for differences in childhood developmental trajectories and discernible cognitive problems captured by standardized test-batteries in adolescence, sources for reports of social dysfunction are currently mainly retrospective. Few birth cohort studies have focused on this age interval and the conscript studies – with the exception of the Israeli – have mainly investigated cognitive functioning. The indications of smaller social networks and lower academic expectations in the current study however suggest that there are some underlying problems.

The strongest predictor of later caseness was the experience of socioeconomic problems over last year, a phenomenon that could be seen as a more long-term stressor. This may explain why we found an association to these, but not to traumatic events that often can be acute and more time limited in nature. In the current study, the survey also asked only for traumatic events during the last 12 months i.e. after the age of 15. The literature on the increased risk associated with early trauma primarily shows an effect for events taking place before the age of 12 (Fisher et al., 2010). Regarding the question of "being exposed to sexual violence



**Table 1**  
Demographic characteristics and survey responses for clinical cases (CP) and population control (PC) group.

Variable	Confirmed psychosis group (CP) <i>n</i> = 30	Population control group (PC) <i>n</i> = 2850	Test statistics <sup>†</sup>	<i>p</i>
Female <i>N</i> /%	20/67%	1612/57%	$\chi^2$ 1.235	0.355
Lived in Norway < 15 years	1/3%	311/11%	$\chi^2$ 0.172	0.564
<b>Attachment to friends</b>				
Respondent feel closely attached to friends Median/Range	1.0/1–4	1.0/1–4	<i>U</i> 40,015.500 <i>z</i> – 0.880	0.427
Friends value respondents opinions median/range	1.0/1–4*	1.0/1–4	<i>U</i> 37,891.000 <i>z</i> – 0.880	0.379
Respondent can help/ support friends Median/Range	1.0/1–3	1.0/1–4	<i>U</i> 39,902.500 <i>z</i> – 0.901	0.368
Respondent can count on friends Median/Range	1.0/1–4	1.0/1–4	<i>U</i> 39,256.500 <i>z</i> – 1.017	0.309
<b>Size of social network</b>				
<i>N</i> of persons that would help with personal problems <sup>#</sup> Mean/S.D.	0.630/0.292	0.740/0.354	<i>F</i> 2.699	0.101
<i>N</i> of persons that would help if practical problems <sup>#</sup> Mean/S.D.	0.515/0.292	0.666/0.380	<i>F</i> 5.489	0.019
<b>Relevant assessments of academic functioning from the YS questionnaire</b>				
School grades (mean of four grades) Mean/S.D.	3.7/0.70**	3.8/0.79	<i>F</i> 0.312	0.576
Experienced difficulties concentrating in class Median/Range	2.0/1–3	2.0/1–3	<i>U</i> 41,554.00 <i>z</i> – 0.286	0.775
Ambitions attending university or college level <i>N</i> /%	22/73%*	2452/86%	$\chi^2$ 4.397	0.054
<b>Relevant measures of environmental stressors from the YS questionnaire</b>				
<b>Family attachment</b>				
Respondent feels attached to family Median/Range	1.0/1–3	1.0/1–4	<i>U</i> 42,450.00 <i>z</i> – 0.078	0.937
Family takes respondent seriously Median/Range	1.0/1–4	1.0/1–4	<i>U</i> 42,427.00 <i>z</i> – 0.079	0.269
Family value respondents' opinions Median/Range	2.0/1–4	2.0/1–4	<i>U</i> 38,103.00 <i>z</i> – 1.106	0.269
Respondent means a lot to family Median/Range 1	1.0/1–3	1.0/1–4	<i>U</i> 40,154.00 <i>z</i> – 0.749	0.454
Respondent can count on family when in need of help Median/Range	1.0/1–3	1.0/1–4	<i>U</i> 41,364.00 <i>z</i> – 0.415	0.678
<b>Other family conditions</b>				
Living with both parents ( <i>N</i> /%)	22/73%	1790/63%	$\chi^2$ 1.371	0.262
Father working full time ( <i>N</i> /%)	19/63%	2287/82%	$\chi^2$ 7.356	0.013
<b>Negative life events last 12 months</b>				
Parent unemployed or qualified for disability pension last year ( <i>N</i> /%)	2/7%	257/9%	$\chi^2$ 0.200	1.000
Other close persons seriously ill or injured last year ( <i>N</i> /%)	10/33%	1223/43%	$\chi^2$ 1.113	0.355
Someone close died last year ( <i>N</i> /%)	6/20%	815/29%	$\chi^2$ 1.076	0.416
<b>Traumatic events last 12 months</b>				
Exposed to sexual violation last year ( <i>N</i> /%)	1/3%*	184/7%	$\chi^2$ 0.432	1.000
Experienced bullying at school last year Median/Range	1.0/1–4	1.0/1–4	<i>U</i> 40,924.50 <i>z</i> – 0.639	0.523
Victimized of other forms of violence last year ( <i>N</i> /%)	4/13%	810/28%	$\chi^2$ 3.333	0.069
<b>Ongoing worries and problems last 12 months</b>				
Very often quarrels or conflicts with parents ( <i>N</i> /%)	5/17%	451/16%	$\chi^2$ 0.016	0.804
Parent/carer had mental problems last year Median/Range	1.0/1–4	1.0/1–4	<i>U</i> 39,080.5 <i>z</i> – 1.277	0.202
Very often economic problems for parent/carer last year ( <i>N</i> /%)	4/13%	82/3%	$\chi^2$ 11.204	0.011
Very often drug or alcohol problems in parent/carer last year ( <i>N</i> /%)	0/0%	41/1%	$\chi^2$ 0.438	1.000
Very often problems in relation to friends ( <i>N</i> /%)	1/2%	50/98%	$\chi^2$ 0.425	0.417
Very often worries about sex ( <i>N</i> /%)	2/7%	59/2%	$\chi^2$ 3.025	0.132

<sup>#</sup> log 10 transformed.

\* Lacking information for 1–2 CC respondents.

\*\* Lacking information for 3–4 CC respondents.

<sup>†</sup>  $\chi^2$  refers to Fisher's exact test.

**Table 2**  
Binary logistic regression with group membership (CP vs. PC) as dependent variable. Final model.

Variable	<i>B</i>	S.E.	<i>p</i>	OR	95% CI
Number of persons that would help if practical problems	–0.965	0.507	0.057	0.38	0.141–1.029
Victimized or experiencing other forms of violence last year	–0.965	0.543	0.076	0.38	0.131–1.105
No ambitions attending university or college level	0.869	0.423	0.04	2.39	1.041–5.465
Very often economic problems for parent/carer last year	1.644	0.365	0.003	5.18	1.732–15.480
<b>Model summary: –2 Log likelihood 307.075; <math>\chi^2</math> 5.342; d.f. 8; sig. 0.720</b>					

during the last year”, we found an incidence of 7% among PC and 3% among CP (see Table 1), which is a higher yearly incidence than reported for adults (0.7% for men and 1.7% for women) (de Haas et al., 2012). A more speculative interpretation of the findings of lower rates of exposure to violence combined with indications of smaller social networks in the CP group is that the adolescents who later develop psychotic disorders have a slower social maturation than the PC group, and are slightly more withdrawn and thus less into typical teen-age risk taking behaviors. However, traumatic events taking place even closer to the actual onset of the first psychotic episode might serve as a more proximal risk factor.

The relative small number of patients that had developed a psychotic disorder at the time of register linkage may explain a lack of statistical power but not the lack of nominal differences between groups. As age at current follow-up was in the early twenties, the group was only midway in the period of risk and theoretically only half of those who would develop a psychotic disorder had experienced first episode. It could thus not be ruled out that the PC group included a limited number of persons who later would be defined as CP. However, since psychotic disorders are rare (expectation of approximately 30 cases in a group of this size) and the PC group large (around 3000 cases) there is no reason to believe that this admixture would influence the results. The low number however put restrictions on the possibility to perform follow-up analyses and the number of variables to explore in multivariate analyses. A small group is also more vulnerable to attrition bias. While the group recruited from Oslo could be subject to attrition bias due to problems with recruitment procedures, the Hedmark/Oppland group consisted of all patients from this age group that had come into treatment by the age of 24.

The main strength of the current study is the unique dataset of unbiased self-reports giving a new perspective on this phase of life in persons who develop psychotic disorder. The main limitations are, in addition to the low number in the CP group, the inherent limitations associated with the adolescents' self-reports in particular the short period of report for the potentially traumatic variables that particularly might influence the observed effect of traumatic events compared to what is reported for early- and long-term trauma.

The current study supports earlier studies indicating that long-term socioeconomic stressors may serve as risk factors for the development of psychotic disorders. It also gives indications of subtle problems in social and academic functions, but all over does not support that major reductions in perceived quality of social- and academic functioning are present at the age of 16. The latter is informative for programs aiming at recruiting high-risk persons in this age group.

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